SPECIAL ISSUE: THE FREE-AIR CARBON DIOXIDE ENRICHMENT (FACE) COTTON PROJECT: A NEW FIELD APPROACH TO ASSESS THE BIOLOGICAL CONSEQUENCES OF GLOBAL CHANGE

CONTENTS

Introduction

Introduction to the Free-Air Carbon dioxide Enrichment (FACE) cotton project
W.A. Dugas (Temple, TX, USA) and P.J. Pinter, Jr. (Phoenix, AZ, USA) 1

Research Papers

The FACE program
G.R. Hendrey (Upton, NY, USA) and B.A. Kimball (Phoenix, AZ, USA) 3

Design and application of a free-air carbon dioxide enrichment facility
K.F. Lewin, G.R. Hendrey, J. Nagy (Upton, NY, USA) and R.L. LaMorte (Phoenix, AZ, USA) 15

FACE facility CO_2 concentration control and CO_2 use in 1990 and 1991
J. Nagy, K.F. Lewin, G.R. Hendrey, E. Hassinger (Upton, NY, USA) and R. LaMorte (Phoenix, AZ, USA) 31

Growth and yield of cotton in response to a free-air carbon dioxide enrichment (FACE) environment
J.R. Mauney, B.A. Kimball, P.J. Pinter, Jr., R.L. LaMorte (Phoenix, AZ, USA), K.F. Lewin, J. Nagy and G.R. Hendrey (Long Island, NY, USA) 49

Effects of free-air CO_2 enrichment on cotton root growth
S.A. Prior, H.H. Rogers, G.B. Runion (Auburn, AL, USA) and J.R. Mauney (Phoenix, AZ, USA) 69

Carbon isotope dynamics of free-air CO_2-enriched cotton and soils
S.W. Leavitt (Tucson, AZ, USA), E.A. Paul (East Lansing, MI, USA), B.A. Kimball (Phoenix, AZ, USA), G.R. Hendrey (Upton, NY, USA), J.R. Mauney (Phoenix, AZ, USA), R. Rauschkolb (Maricopa, AZ, USA), H. Rogers (Auburn, AL, USA), K.F. Lewin, J. Nagy (Upton, NY, USA), P.J. Pinter, Jr. (Phoenix, AZ, USA) and H.B. Johnson (Temple, TX, USA) 87

Free-air CO_2 enrichment effects on soil carbon and nitrogen
C.W. Wood (Auburn, AL, USA), H.A. Torbert (Temple, TX, USA), H.H. Rogers, G.B. Runion and S.A. Prior (Auburn, AL, USA) 103

Effects of free-air CO_2 enrichment on microbial populations in the rhizosphere and phyllosphere of cotton
G.B. Runion, E.A. Curl, H.H. Rogers, P.A. Backman, R. Rodríguez-Kábana and B.E. Helms (Auburn, AL, USA) 117

Soil carbon dioxide fluxes in natural and CO_2-enriched systems
F.S. Nakayama (Phoenix, AZ, USA), G. Huluka (Tuskegee, AL, USA), B.A. Kimball (Phoenix, AZ, USA), K.F. Lewin, J. Nagy and G.R. Hendrey (Long Island, NY, USA) . 131

Effects of elevated CO_2 and water stress on mineral concentration of cotton
G. Huluka, D.R. Hileman, P.K. Biswas (Tuskegee, AL, USA), K.F. Lewin, J. Nagy and G.R. Hendrey (Upton, NY, USA) 141

Influence of elevated CO_2 and mild water stress on nonstructural carbohydrates in field-grown cotton tissues
D.L. Hendrix, J.R. Mauney, B.A. Kimball (Phoenix, AZ, USA), K. Lewin, J. Nagy and G.R. Hendrey (Upton, NY, USA) 153

Effect of free-air CO_2 enrichment on the chlorophyll content of cotton leaves
P.J. Pinter, Jr., S.B. Idso, D.L. Hendrix, R.R. Rokey (Phoenix, AZ, USA), R.S. Rauschkolb (Maricopa, AZ, USA), J.R. Mauney, B.A. Kimball (Phoenix, AZ, USA), G.R. Hendrey, K.F. Lewin and J. Nagy (Upton, NY, USA) 163
Leaf water relations of cotton in a free-air CO_2-enriched environment
N.C. Bhattacharya, J.W. Radin, B.A. Kimball, J.R. Mauney (Phoenix, AZ, USA), G.R. Hendrey, J. Nagy, K.F. Lewin (Upton, NY, USA) and D.C. Ponce (Phoenix, AZ, USA) 171
Effects of free-air CO_2 enrichment on the light response curve of net photosynthesis in cotton leaves
S.B. Idso, B.A. Kimball, G.W. Wall, R.L. Garcia, R. LaMorte, P.J. Pinter, Jr., J.R. Mauney (Phoenix, AZ, USA), G.R. Hendrey, K. Lewin and J. Nagy (Long Island, NY, USA) . 183
Canopy photosynthesis and transpiration of field-grown cotton exposed to free-air CO_2 enrichment (FACE) and differential irrigation
D.R. Hileman, G. Huluka, P.K. Kenjige, N. Sinha, N.C. Bhattacharya, P.K. Biswas (Tuskegee, AL, USA), K.F. Lewin, J. Nagy and G.R. Hendrey (Upton, NY, USA) 189
Effects of free-air carbon dioxide enrichment on PAR absorption and conversion efficiency by cotton
P.J. Pinter, Jr., B.A. Kimball, J.R. Mauney (Phoenix, AZ, USA), G.R. Hendrey, K.F. Lewin and J. Nagy (Upton, NY, USA) 209
Sap flow measurements of transpiration from cotton grown under ambient and enriched CO_2 concentrations
W.A. Dugas, M.L. Heuer (Temple, TX, USA), D. Hunsaker, B.A. Kimball (Phoenix, AZ, USA), K.F. Lewin, J. Nagy (Long Island, NY, USA) and M. Johnson (Phoenix, AZ, USA) 231
Cotton evapotranspiration under field conditions with CO_2 enrichment and variable soil moisture regimes
D.J. Hunsaker (Phoenix, AZ, USA), G.R. Hendrey (Upton, NY, USA), B.A. Kimball (Phoenix, AZ, USA), K.F. Lewin (Upton, NY, USA), J.R. Mauney (Phoenix, AZ, USA) and J. Nagy (Upton, NY, USA) 247
Effects of free-air CO_2 enrichment on energy balance and evapotranspiration of cotton
B.A. Kimball, R.L. LaMorte, R.S. Seay, P.J. Pinter, Jr., R.R. Rokey, D.J. Hunsaker (Phoenix, AZ, USA), W.A. Dugas, M.L. Heuer (Temple, TX, USA), J.R. Mauney (Phoenix, AZ, USA), G.R. Hendrey, K.F. Lewin, J. Nagy (Upton, NY, USA) 259
Influence of enhanced CO_2 concentration and irrigation on sudangrass digestibility
D.E. Akin (Athens, GA, USA), B.A. Kimball, J.R. Mauney, R.L. LaMorte (Phoenix, AZ, USA), G.R. Hendrey, K. Lewin, J. Nagy (Long Island, NY, USA) and R.N. Gates (Tifton, GA, USA) 279
COTCO2: a cotton growth simulation model for global change
G.W. Wall (Phoenix, AZ, USA), J.S. Amthor (Woods Hole, MA, USA) and B.A. Kimball (Phoenix, AZ, USA) 289